“The design process can be thought of as a series of transformations going from uncertainty towards information. The successive stages of the process are usually registered by some kind of graphic model. In the final stages of the design process, designers use highly formalized graphic languages such as those provided by descriptive geometry. But this type of representation is hardly suitable for the first stages, when designers use quick sketches and diagrams... It has been accepted for years that because of the high level of abstraction of the ideas which are handled at the beginning of the design process, they must be expressed necessarily by means of a rather ambiguous, loose graphic language—a private language which no one can properly understand except the designer himself... the high level of abstraction of the information which is handled must not prevent us from using a clearly defined graphic language. Such a language would register the information exactly at the level of abstraction it has, and it would facilitate communication and cooperation among designers.”

My own version of a graphic language is based on experience with students in the design studio and research in design process communications. It is presented here because I am convinced that a “clearly defined graphic language” is important to design thinking as well as communication between designers.

“A language consists of a set of rules by which symbols can be related to represent larger meanings.” The difference between verbal and graphic languages is both in the symbols used and in the ways in which the symbols are related. The symbols for verbal languages are largely restricted to words whereas graphic languages include images, signs, numbers, and words. Much more significant, verbal language is sequential, it has a beginning, a middle and an end. Graphic language is simultaneous, all symbols and their relationships are considered at the same time. The simultaneity and complex interrelationship of reality accounts for the special strength of graphic language in addressing complex problems.

The graphic language proposed here has grammatical rules comparable to those of verbal language. The diagram of the sentence (a) shows three basic parts: nouns, verbs, and modifiers such as adjectives, adverbs and phrases. Nouns represent identities, verbs establish relationships between nouns, and the modifiers qualify or quantify the identities or the relationships between identities. In the graphic diagram (b) identities are shown as circles, relationships are shown as lines and modifiers are shown by changes in the circles or lines (heavier lines indicating more important relationships; tones indicating differences in identities). In the sentence diagram, the verb shows a relationship that the subject has to the object, the dog caught the bone. The line in the graphic diagram is bi-directional; it says that the living room is connected to the kitchen and that the kitchen is connected to the living room. Thus the graphic diagram contains many sentences as:

(c) The very important living room has a minor relationship to the garage.
(d) The dining room must be connected to the special spaces, the kitchen and the deck.
(e) The future guest house will be related to the entry and indirectly to the pool.
GRAMMAR

There are other ways of drawing “graphic sentences;” three alternatives are shown here.

Position—an implied grid is used to establish relationships between identities; the resulting order sometimes makes the diagram easier to read (a).

Proximity—the degree or intensity of the relationships of identities is indicated by the relative distances between them (b). A significant increase in distance can imply that no relationship exists. This type of diagram has more flexibility than the former type.

Similarity—identities are grouped by common characteristics such as color or shape (c).

These alternatives may also be combined to form other grammatical variations (d) but care should be taken to retain consistency. In order to communicate clearly, the grammatical rules should be immediately evident. “The binding fact of mental life in child and adult alike is that there is a limited capacity for processing information—our span, as it is called, can comprise six or seven unrelated items simultaneously. Go beyond that and there is overload, confusion, forgetting.”

One
of the purposes for adopting some basic grammatical rules in graphic diagrams is to avoid confusion by reducing the number of variables to be handled at one time.

One of the most useful qualities of graphic communication is that information can be transmitted and received on several levels, simultaneously. Artists recognized this long ago. Successful paintings usually appeal to the viewer as overall compositions, renderings of detail, and technique with media, just to name a few of the levels. These levels of communication can be used to good advantage in a graphic diagram. The basic process for building a diagram (4–3) is:

1. Try to illustrate the basic identities and their relationships in a rough diagram.
2. Reduce the diagram to its simplest structure by applying rules of graphic grammar.
3. Modify the diagram to indicate a second level of information, using tones or heavy lines.
4. Add other levels of information as tag-ons to the basic diagram.
5. If the diagram becomes too complicated break it into segments by grouping or placing a boundary around identities.
VOCABULARY:

Identities

There are a great number of ways of symbolizing an identity. The more common symbols are represented here in horizontal rows. The identity of these different possible groups is achieved by contrast. Usually all variables are held constant except for one. The number in each group is limited because most of us are unable to deal with more than five or six variations in one graphic diagram. The elementary symbols can be supplemented or replaced by numbers, letters or other symbols. By judiciously combining different groups of symbols it is possible to have several levels of information in a graphic diagram without sacrificing clarity.

Sometimes identities are best shown with a more tentative quality using dotted and irregular lines. Later chapters will further explain this less definite need,
Relationships

As with identities, different relationships are best represented by sets of line types. These line types can also be used as borders for grouping identities as a means of segmenting a diagram or of showing special relationships.

The arrow is a very special device for indicating relationships. As a symbol of movement, it has compelling qualities: "... any movement in the environment automatically attracts attention because movement means change of conditions, which may call for a reaction." Arrows combined with lines can indicate a one-way relationship, a sequence of events, or a process. Separate arrows can be used to mark important parts of a diagram or to show dependencies and the feed-in of supplementary information.
Modifiers

Identities and relationships are modified according to an hierarchical system. In this manner, the significance of parts and the different levels of intensity in the relationship between parts are expressed. Hierarchy can be shown by different line widths, multiple lines, or the relative size of dashes and spaces in dashed lines (a). Graded tones and the accumulation of parts are also useful devices (b).

Modifiers can also create emphasis, principally through contrast in terms of size, tone, contour, or detail. Emphasis signals a special identity or relationship, segregates interwoven diagrams, or indicates special points or steps in a process (c).
Other Graphic Vocabulary

Several disciplines have developed their own shorthand symbols to facilitate rapid communication. Many of these symbols have a wide enough understanding to be useful in graphic thinking. Some of the most useful symbols, taken from the disciplines of mathematics, systems analysis, engineering and cartography are shown on the following pages.

- \(=\) equal to
- \(\geq\) larger than
- \(\equiv\) identically equal to
- \(\leq\) smaller than
- \(\neq\) not equal to
- \(\approx\) approximately equal to
- \(\not\leq\) larger than or equal to

- \(\sim\) proportional to
- \(\therefore\) corresponds to
- \(\therefore\) and so on

\(\pm\) plus-or-minus
\(\therefore\) therefore
\(\therefore\) and so on
Operations research and the analysis of communication systems led to the study of processes which, in turn, led to many applications of process management. With the study of more complicated processes, a diagrammatic language was developed in order to properly describe these processes (a). On the basis of a few symbols and a set of rules for using them, very elaborate processes can be readily explained in graphic terms. Some of the symbols shown to the right are useful in describing architecturally-related processes such as project plans, construction organization, and programmatic functions (b).

On the facing page are several symbols used in electrical, mechanical, and transportation engineering which can further extend our graphic vocabulary.
Graphic language elements from other areas of the building industry
THE USES OF GRAPHIC LANGUAGE

"Unless detail is placed into a structured pattern, it is rapidly forgotten. . . . Detailed material is conserved in memory by use of simplified ways of representing it." The graphic 'vocabulary' just presented was selected because the symbols are commonly accepted, simplified ways of representation. Since our graphic vocabulary will continue to expand graphic communication, we must use symbols commonly understood and a clear grammatical structure as a context for the vocabulary to be effective. The obvious corollary is our necessity to become graphically 'literate.' We need to become familiar with a range of graphic languages. "The thinker who has a broad command of graphic language not only can find more complete expression for his thinking but can also recenter his thinking by moving from one graphic language to another . . . in effect he uses language to expand the range of his thinking." This last point is extremely important to a full use of the material presented in this book. Communication and thinking are intertwined purposes; we need to focus on how they assist each other rather than ask which is more important.

Graphic language can have pitfalls as identified by Robert McKim.

1. Lack of skill or inappropriate choice of language can be damaging to tender new concepts.
2. Mistaking graphic images for reality
3. Glamorizing an idea
4. Concealing what should be revealed
5. Habitual use of a few languages avoids some types of mental operation.
TRANSFORMATION FROM PROGRAM TO SCHEMATIC DESIGN

To close the discussion of graphic language, we return to the challenge of handling information "exactly at the level of abstraction it has" throughout the design process. In the example shown, the process is in stages of lesser abstraction from the building program to a schematic design for a house (the transformations after the schematic design which lead to the final building are preliminary design, design development, construction documents, and shop drawings. These are not shown because effective conventions already exist for representation of those stages; there are several sources for examples of those drawings, including books and the drawing files of architectural firms).

The first diagram is an abstraction of the program of the house. The functions and the relationship between functions are indicated as well as the hierarchy of these functions and relationships. The major access points are clearly visible. The "bubbles" have no positional significance because the program does not contain that sort of information. If the relationship links between functions are retained, the bubbles can be moved to several different positions without changing the basic information of the diagram, as in the smaller diagrams. The second diagram responds to site and climate information establishing both position and orientation of functions with respect to each other and the site. Natural light and heat, views, building access, and zoning of functions are also considered. The third diagram reflects decisions on scale and shape of the spaces required to accommodate the programmed functions. Here, consideration is given to functional needs and a planning grid. In the fourth diagram, specific structural,
construction, and enclosure decisions come into play. Sufficient formal definition has been indicated for the diagram to be called a schematic design.

This transformation from program to schematic design is only one of vast numbers of paths that could have been taken. By understanding the intent of the diagrams at each stage, we insure that options remain open, rather than lock into one form too early.

Most designers will agree that designing is not a "clean" process; in other words, it is not automatic, even-paced, directional, orderly or rational. We would probably agree that it is highly personal, discreet while holistic, sometimes very clear and sometimes quite obscure, sometimes rapid and sometimes painfully slow, exciting and also tedious. In short, it is very human rather than mechanistic. And that is why so many of us are so passionately hooked on designing.

Drawings, the visual language, designers use reflects all of the qualities I have attached to designing. In the following chapters I have tried to recognize the variability and individuality of design processes by not associating graphic thinking with one design process. Rather I have presented the uses of drawings as discreet events; to uncover the breadth of richness that exists and leave open to each of us all of the ways and styles of graphic thinking or designing that we prefer, that we enjoy!